The Ins and Outs of CAD Programs

By Bill Hylton

I don't draw well. I know what I want all right, but my fine motor skills are deficient. It's downright frustrating when I want to draw plans for a new project. My lines are inconsistent and wavering, always a hair too long or too short. I make so many little mistakes that my erasers disappear long before my pencils wear down. When I do get done, my designs usually need a little ... uh ... somethin'.

Something, of course, that means redrawing the entire plan.

Here's why I love computer-aided drafting (CAD):

In CAD ...

- Lines are always straight, crisp and consistent.
- Drawings are always clean, free of blotches and eraser smudges.
- The scale is always precise, and accurate dimensions can be pulled off most anywhere.
- Dimensions and proportions can be altered quickly without redrawing everything.
- Elements of one drawing can be copied into a new one in seconds.
- Full-size patterns can be printed and used in the shop.

I've been using CAD for over a decade, though I certainly don't consider myself proficient. I figured out the basics, but my CAD skills are still where they were seven years ago. Determined to upgrade, I recently undertook a review of inexpensive CAD programs, meaning those priced under $150.

The affordability of CAD is striking to me. Bought at a big discount, my AutoCad LT98 cost about $350; the current version retails for $899. But for less than $150, I can get a different CAD program with far more features. And if I choose the right one, I'll be able to access and use all the drawings I've created since 1998.

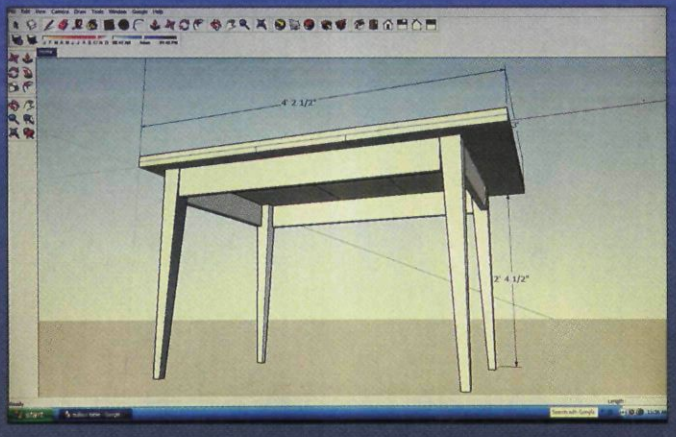
To use CAD, here's what you need — besides a computer, of course:

Computer Savvy:
If you have a Windows-based personal computer or an up-to-date Mac and run the typical assortment of household or business software — word processing, bookkeeping, web browsing — then you surely have the requisite computer skills.

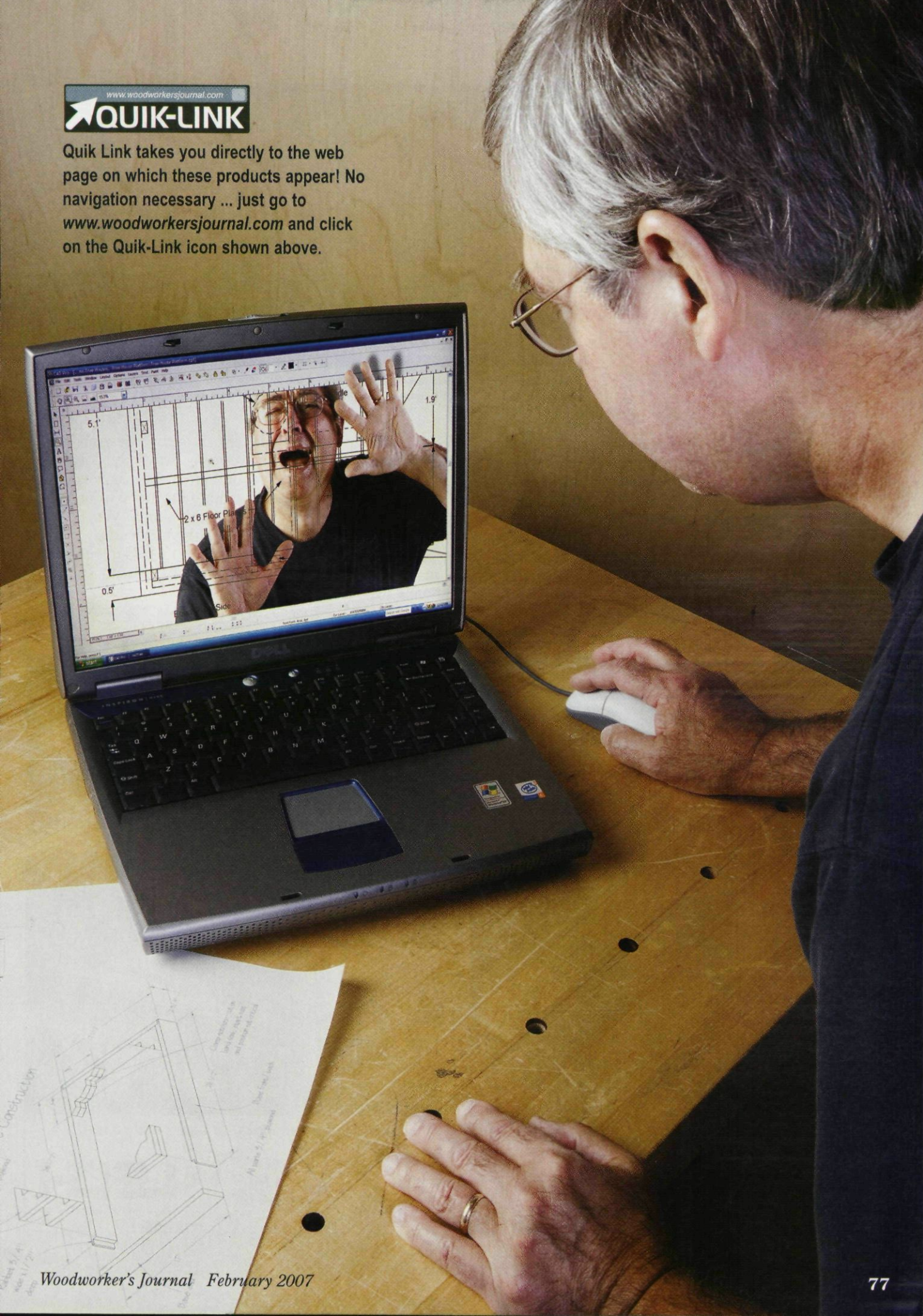
To use CAD programs, you need to be able to use the keyboard and the mouse. That's essential. You also need to understand how to use drop-down menus and those buttons labeled with icons. (Wait 'til you get a load of CAD icons; talk about fleas on a mangy dog!)

Basic Drafting Know-how:
Traditionally, shop drawings, often called measured drawings, are two-dimensional and include two or three views, the latter usually being the front view or elevation, the top view and a side or profile view. Depending on the complexity of the object itself, additional views might be needed

CAD FOR THE HOME SHOP

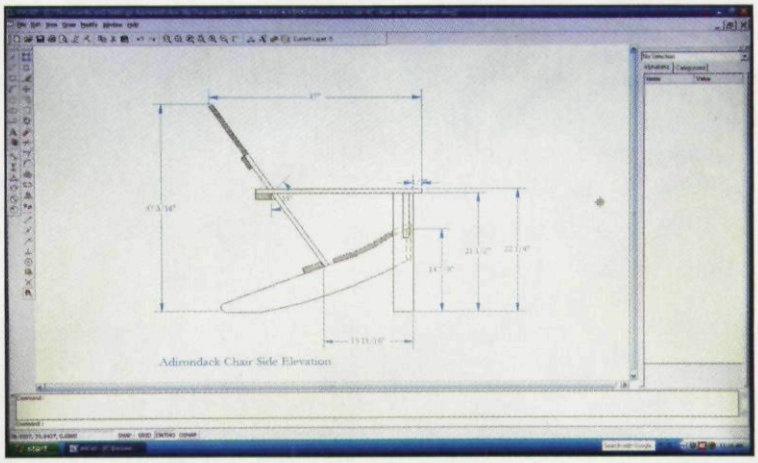


Computer-Aided Design (a.k.a. computer-aided drafting) has entered the realm of the home woodworker. We asked Bill Hylton to take the digital dive and plunge into a pool of consumer level CAD products. Judging from the photo at right, Bill might have gotten a little too into his work!


www.woodworkersjournal.com
QUIK-LINK
Quik Link takes you directly to the web page on which these products appear! No navigation necessary ... just go to www.woodworkersjournal.com and click on the Quik-Link icon shown above.

A9CAD
Contact: *www.a9tech.com*
Cost: Free
Type: 2D only
Vehicle: 15.5 MB download
Sys. req.: Windows 98/ME/2000/XP
Documentation: Help menu only
Demo: None
Tutorials: None
User forum: No
Upgrades: A9Cad Pro ($29.95)

For more info on the web: use our QUIK-LINK



The A9Cad screen strings the toolbars along the top and left margins, leaving a large drawing area. A lack of how-to info is the free program's primary drawback.

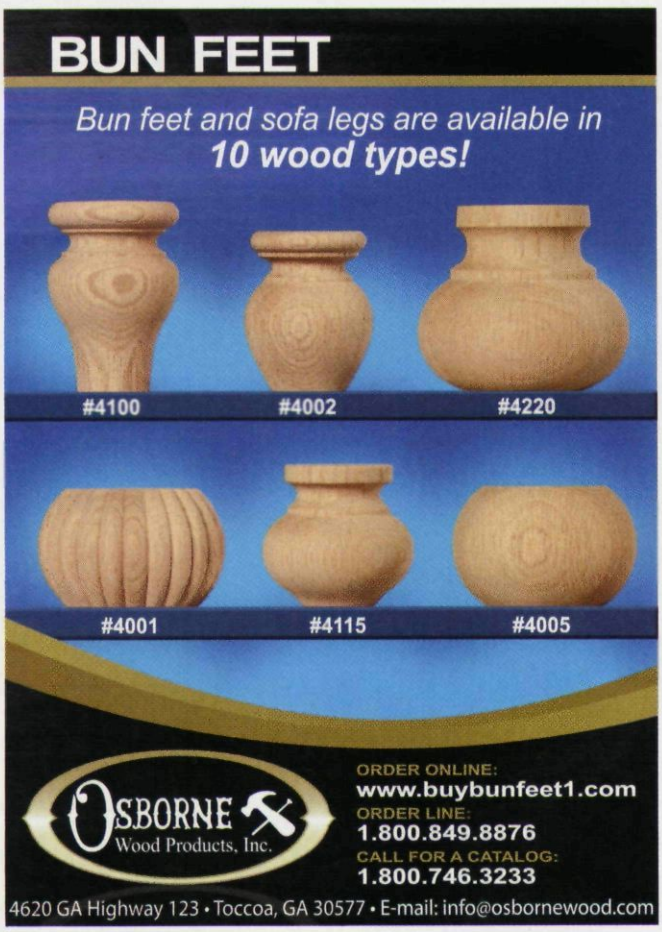
as well — a second profile, a back or bottom view, a section or details.

Each view depicts a single plane and, taken alone, it conveys little about depth or texture. Overall dimensions are shown, along with a selection of other dimensions that help the woodworker build the piece. Moreover, the views will be drawn to scale, so dimensions not called out can be determined by measuring the drawing and scaling up from it.

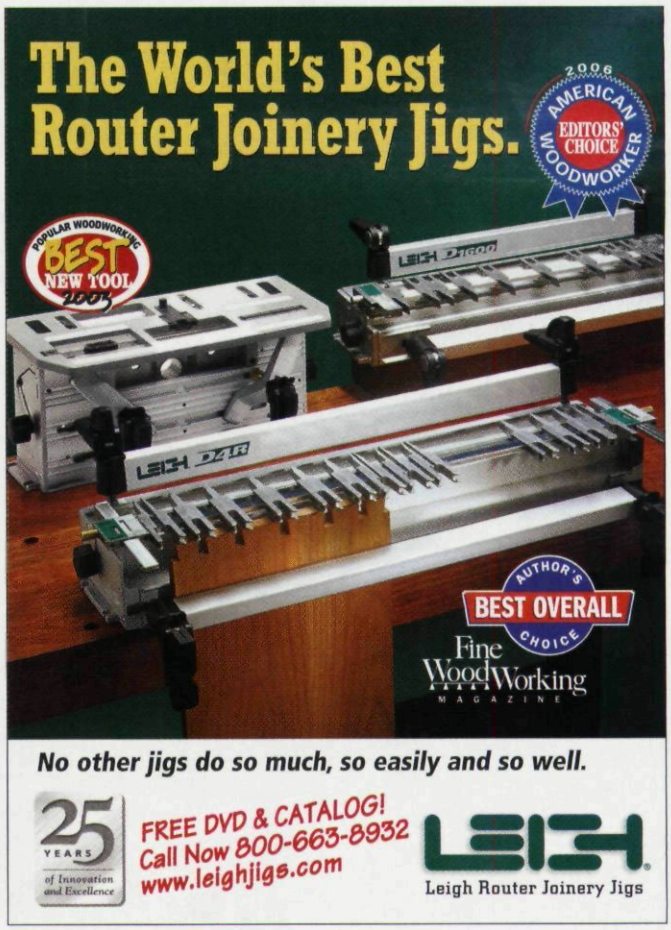
Missing from traditional shop drawings is a clear picture of what the object looks like. In life, we seldom see objects in only two dimensions. We see two or three faces from a single vantage point. The traditional solution is the pictorial drawing — an isometric, oblique or perspective view, all of which are really two-dimensional.

My point here is that you've got to know what to draw. Without that, CAD won't benefit you. (For more on the importance on drawing, see Ian Kirby's *Roadmaps of Woodworking* on page 56).

Tool Review continues on page 80 ...



(Circle No. 68 on PRODUCT INFORMATION form)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LEIGH D4R
LEIGH D1600
AUTHOR'S CHOICE BEST OVERALL
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www.leighjigs.com
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Leigh Router Joinery Jigs

Best Bet: 3D Drafting Program

ALIBRE DESIGN XPRESS
Contact: *www.alibre.com*
Cost: Free
Type: 3D parametric modeling
Vehicle: 100 MB download
Sys. req.: Windows Xp, 800 MHz Pentium, 512 MB RAM
Documentation: 601-page PDF
Demo: None
Tutorials: Introduction video, drawing exercises incorporated into software
User forum: *www.alibre.com/xpress/forum/*
Upgrades: Alibre Design Standard ($995), Professional ($1,495), Expert ($1,995)

For more info on the web: use our QUIK-LINK

Alibre Design Xpress is a free — but huge — download that has good tutorials with whiz-bang drawing samples you can spin and roll and turn. But hand-cutting dovetails may be easier to master than this complex program's many capabilities.

Determination:
Learning to draw with a CAD program can be frustrating and exasperating. The programs are enormously complex. Documentation tends to be either sketchy or opaque. In a few cases, it is virtually nonexistent. You have to be determined and persevering.

Pigeonholing CAD Programs
My online search for CAD programs turned up an "affordable dozen" (see the product boxes). Let's sort the programs into types first.

2D programs: About half of the "affordable dozen" are 2D exclusively, and only one can be upgraded to a package with 3D capability. But don't look past them. Any 2D program enables you to create traditional measured drawings. Remember that every museum-preserved piece of furniture was built from plans drawn in two dimensions.

Unlike pencil-and-paper drafting, CAD gives you the ability to draw a two-dimensional view of your design, then experiment with it. You can quickly (and reversibly) alter the dimensions and proportions. You can add features like doors and drawers, decorative moldings or embellishments, then quickly remove them. You can reconfigure legs or feet. You can transform an elevation or profile view into a section view, slicing through your project to reveal joinery and otherwise hidden features.

Using a 2D program, you also can create pictorial views, such as isometric and oblique views. While they aren't 3D, they do show more than one face of the project, and they can be very helpful in conveying what the project will look like.

This is a solid foundation for anyone new to CAD. The general skills you master in 2D will carry into 3D, even if switching to a 3D program forces you to learn new terms and tools.

2D/3D programs: Just the idea of 3D is intoxicating. The attraction is obvious. You can see what the project will look like. The best 3D programs allow you to "orbit" the project in real time, circling around, above and below it. They allow you to print views from various viewpoints. Thus, you can show your design to a spouse or client and get their approval before cutting a single board.

Three of the "affordable dozen" give you all the features and functions of 2D programs,

Try Freeware First

Don't take my word on any of these programs. In most cases, you don't have to! Three programs — SketchUp, A9Cad and Alibre Design Xpress — are "freeware." There's no charge! Simply point your web browser to the program web site and download the program. Only Alibre requires you to register before downloading the program. What you get is fully functioning and has no time limit on your use of it.

Free trial versions are available for seven other programs in the "affordable dozen" reviewed here (see the individual product boxes). Trial versions typically have a short life, and they do require registration. In exchange for your name and e-mail address, you get a link to a download site or an activation code (e-mailed to the address you supply). After you've installed the program, it will work for two to six weeks, giving you time to try it out.

Be aware that many of these free downloads are huge files. If you are on a dial-up, the free trial may indeed be trying to your patience and modem.

DeltaCad delivers on a single CD-ROM containing the program, a PDF of the user manual and sample files. Simple, easy to learn, DeltaCad is a good entree to CAD.

Best Bet: 2D Drafting Program

DELTACAD PROFESSIONAL VERSION 6.0

Contact: *www.deltacad.com*
Cost: $39.95
Type: 2D only
Vehicle: CD-ROM
Sys. req.: Any version of Windows 80386 processor or better
Documentation: 262-page PDF on CD
Demo: 6 MB download, 45-day time limit
Tutorials: Drawing exercise in manual
User forum: No
Upgrades: None

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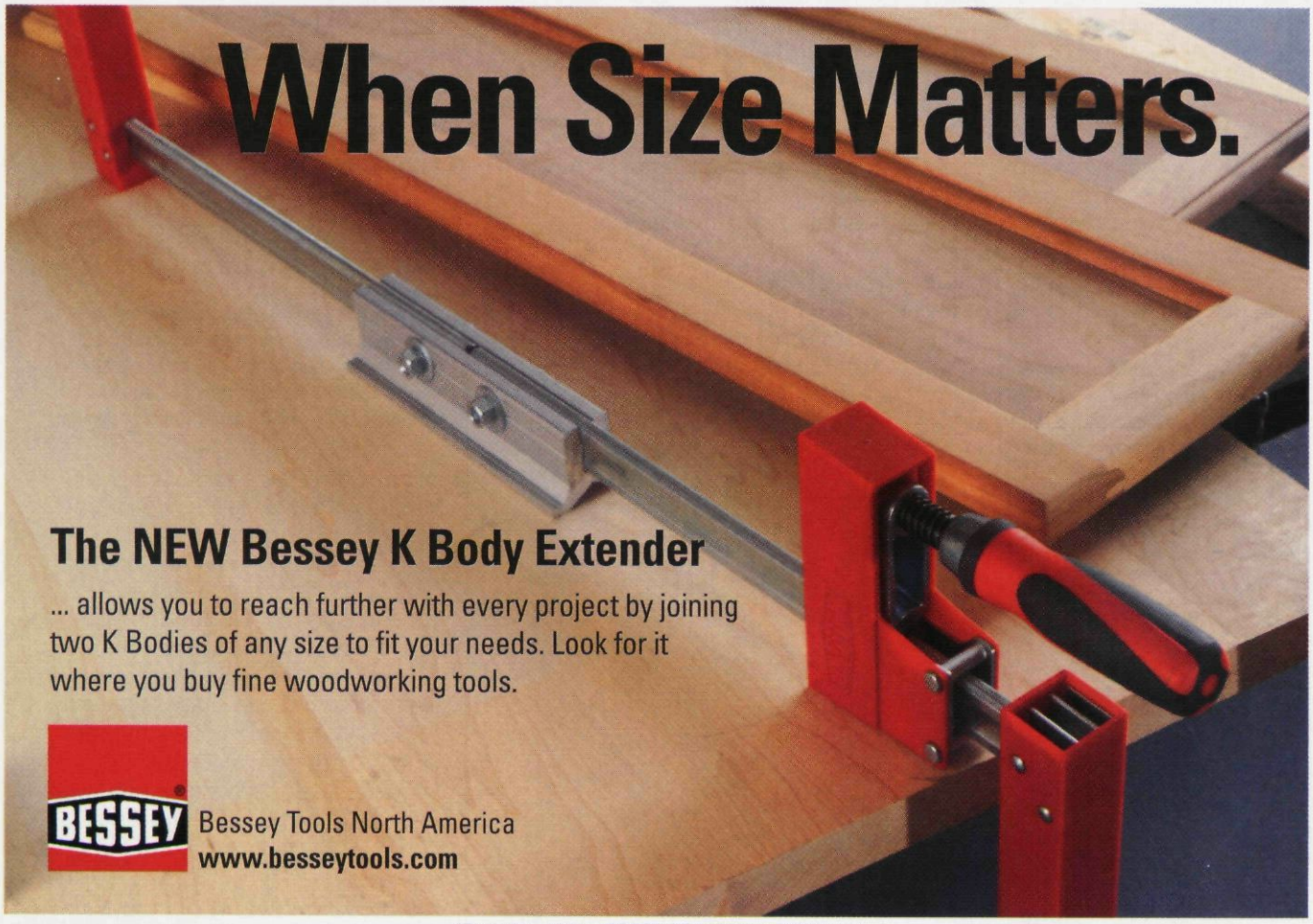
and they transition to 3D as well. Their benefit is that you can focus initially on mastering the basic functions and features of CAD in the 2D realm. You'll learn the program and get measured shop drawings at the same time. When you're comfortable navigating the 2D realm, you can segue into 3D.

My suspicion is that, once you are comfortable using the 3D modeling features available in this level of program, you'll want to upgrade to more powerful (and costly) versions. Happily, the affordable 2D/3D programs have upgrades that dramatically expand the speed, features and capabilities of their baseline version.

3D parametric modeling programs: Parametric modeling is at the high end of the CAD spectrum. The end product is, I think, what a lot of people envision as 3D CAD. It's pretty daunting to tackle, especially if you have no CAD experience whatsoever. Thanks to Alibre's freeware version of its Design software, you can have a look.

Here's an overview: Suppose you are making a table. You draw one leg, one long apron, one short

Tool Review continues on page 82 ...


When Size Matters.
The NEW Bessey K Body Extender
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Bessey Tools North America
www.besseytools.com

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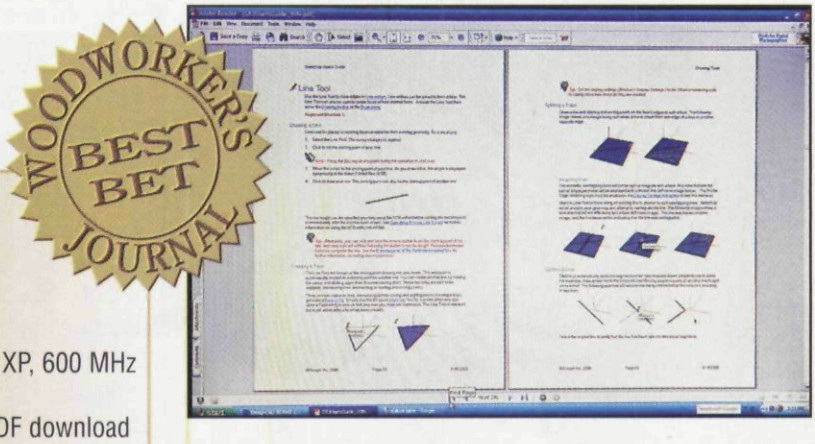
Best Bet : Free Program



SketchUp's training materials are tops. And everything is free! Here's a spread from the User Guide (PDF) displayed in Acrobat Reader.

SKETCHUP BY GOOGLE

Contact: *www.sketchup.com*
Cost: Free
Type: 3D
Vehicle: 18.9 MB download
Sys. req.: Windows 2000 or XP, 600 MHz Pentium III, 128 MB RAM
Documentation: 362-page PDF download
Demo: No
Tutorials: Self-paced tutorials at: *www.sketchup.com/?sid=56;* video tutorials at *www.sketchup.com/?sid=35*
User Forum: *http://forum.sketchup.com/*
Upgrades: SketchUp Pro 5 ($495)

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apron, the tabletop and one button for attaching the top to the stand. Again, each unique part is a separate drawing.

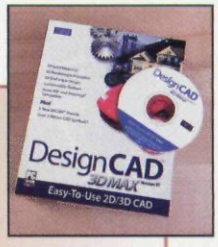
To "draw" the table in 3D, you open a new file and insert each part. You copy parts as needed to methodically assemble the table. "Join" a long apron and a short apron to a leg. Copy the leg and the long apron, and join these copies to the assembly. Copy the leg twice more and the short apron once, and use these copies to complete the base. Insert the tabletop and the button into the assembly drawing. Make as many copies of the button as you need, and use them to mount the top to the base.

If you want to alter the length of the table, you go into the long apron drawing and alter the dimensions. The program will update the assembly drawing, and it will point out that you also need to alter the tabletop dimensions.

It's a lot of work to create the drawings for all those parts and it takes practice to assemble the parts accurately. Advocates of this level of CAD argue that in the long term, it's easier and faster to develop projects because you can reuse old parts in new assemblies.

It is an intriguing concept, but from my perspective, the learning curve looks awfully steep.

An oddball program that fits here is Design Intuition. It isn't a conventional drafting program, but rather it focuses specifically on creating 2D/3D plans and cutting lists for cabinetry.



DESIGNCAD VERSION 17

Contact: *www.imsisoft.com*
Cost: $49.95
Type: 2D/3D
Vehicle: CD-ROM
System Requirements: 200/XP Pentium II or better, 128 MB RAM
Documentation: 288-page printed manual
Demo: No
Tutorials: Tutorial CDs available for purchase
User forum: *forums.upperspace.com/forum.asp?FORUM_ID=2*
Upgrades: DesignCAD 3D Max v. 17 ($89.95)

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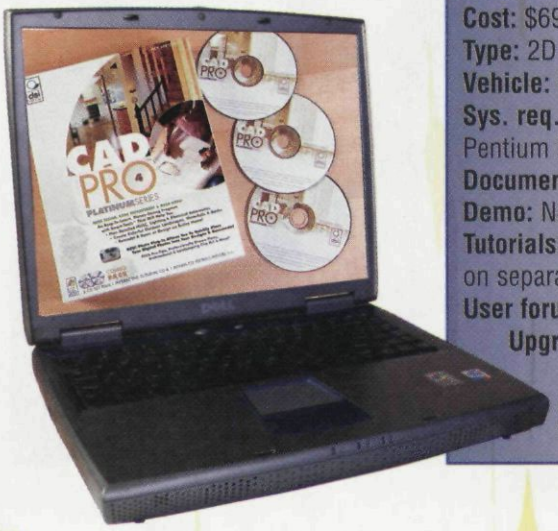
DesignCAD 3D Max ships in a conventional software carton, replete with promotional visuals and text bites. The program and some sample drawing files are on the CD-ROM. You also get a printed user manual.

While I don't recall "parametric" being used in any of the documentation, Design Intuition certainly has parametric characteristics. It draws shapes, and though those shapes appear two-dimensional on the computer monitor, they're really three-dimensional. Each shape you draw has to be named and given that third dimension. As you do this,

Tool Review continues on page 84 ...

CadPro is targeted for the handyman. You get three CD-ROMs, one with the program and manual PDF, one with a tutorial video and one with sample drawing files.



CADPRO 4

Contact: *www.cadpro.com*
Cost: $69.95
Type: 2D only
Vehicle: CD-ROM
Sys. req.: Windows 98SE or newer Pentium II or better, 64 MD RAM
Documentation: 190-page PDF
Demo: No
Tutorials: Video of drawing exercise on separate CD
User forum: No
Upgrades: None

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PC DRAFT PE
Contact: *www.microspot.com*
Cost: $39
Type: 2D only
Vehicle: Download
System Requirements: Windows 95 or newer
Documentation: 376-page PDF
Demo: 7.2 MB download (zipped)
Tutorials: None
User forum: No
Upgrades: PC Draft ($299)

For more info on the web: use our QUIK-LINK

PC Draft PE features a compact toolbar (right). Clicking on an icon activates the tool; clicking and holding triggers a fly-out bar with options.

5 CAD Systems for MAC Users

- **Google SketchUp**
  3D
  free
  www.sketchup.com
- **MacDraft PE**
  2D
  $129
  www.microspot.com
- **CADintosh**
  2D
  $33
  www.lemkesoft.com
- **Design Intuition**
  2D/3D
  $129.95
  www.gizmolab.com
- **TurboCad Macintosh**
  2D/3D
  $99.95
  www.imsisoft.com

you create a parts list. Changing a dimension on the parts list triggers a cascade of other changes to associated parts in the assembly.

The promise is seductive, but the program has its limitations. You can create boxes and cylinders but not lines or arcs. Zooming and panning as you work is cumbersome. The program shows dimensions of individual parts but not assemblies.

In any case, give it a trial run. You can download the program without cost and test it. However, until you pay the license fee and register the program, you won't be able to save anything you draw.

3D-only design: One program is tough to pigeonhole, and that's Google SketchUp. It's all 3D, all the time, and as such it stands apart from all the other programs covered here. That was the intent of its developers. It was created for "conceptual design work" rather than technical drawing.

There's a lot to like about the program, beginning with its price: it's free. A fully functional program is yours to download and use for any noncommercial purpose. No registration required. Use it for business, though, and you are honor-bound to pay for the Pro 5 version, which does have expanded functions.

While harboring vague reservations about it as a drafting program, I find it totally engaging. It's fun (which was the intent, of course).

Open the program, and you discover a person standing in the center of the drawing field beside tricolor X-Y-Z axes. Look at the icons on the toolbar. They're rendered in a "sketchy" style, with a hint of depth and shadowing, rather than the stark styling of most drafting programs. Notice, too, that the icons are whimsical: a pencil draws lines and an eraser removes them.

That young lady standing in the drawing field, by the way, is there to provide a sense of scale for architectural design work — another whimsical touch. Switch to the woodworking template, and she scoots away, replaced by a framing square.

Getting started is easy if you view the self-paced tutorials that you can view on the web site or download to view off-line. Each of the three tutorials takes you step by step through the design of a house. You repeat each step. Do it to your satisfaction before you move to the next step. And, if need be, you can back up a step or two.

These tutorials offer the chance to use the primary drawing and modification tools, including SketchUp's patented Push-Pull tool, which, as a woodworker, you'll use to pull out a tenon or push in a mortise. You experience the program's "inference engine," which helps you locate centers, midpoints and intersection points. Helpful tips pop into view as you work. As you draw a box with the rectangle tool, for example, you're cued when the shape is a square,

POWERCAD LT+
Contact: *www.givemepower.com*
Cost: $99
Type: 2D/3D
Vehicle: CD-ROM
Sys. req.: Windows 95/98/2000/XP
166 MHz or faster Pentium class processor
Documentation: 658-page PDF
Demo: 18.6 MB download
Tutorials: Description of drawing exercise at web site
User forum: Yes
Upgrades: PowerCAD Classic ($299)
PowerCAD Pro ($595)

For more info on the web: use our QUIK-LINK

Tool Review continues on page 86 ...

DESIGN INTUITION
Contact: *www.gizmolab.com*
Cost: $129.95 for license
Type: 2D/3D
Vehicle: 2.2 MB download
Sys. req.: Windows 2000/XP
Documentation: 79-page PDF
Demo: Yes; unregistered program works but won't save drawings
Tutorials: Description of drawing exercise at web site
User forum: No
Upgrades: None

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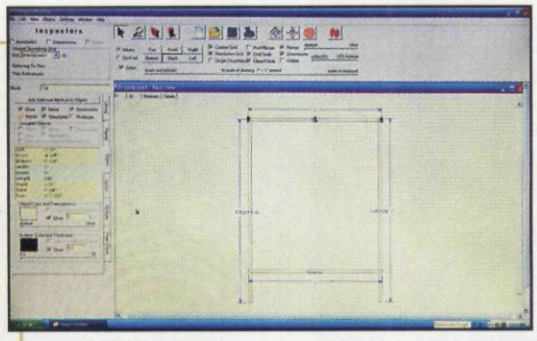


The Design Intuition screen display has only a dozen tool icons, but it's nonetheless crowded with tabs, boxes, buttons, and sliders.

then again when it is at the Golden Mean. How cool is that?! You play with the screen navigation tools — pan, zoom and orbit. Great fun!

Beyond the tutorials, SketchUp has an excellent user manual, which begins with a 40-page-long conceptual overview, something sorely missing from other programs' instruction manuals. Subsequent sections document all the tools and functions. The SketchUp web site has endless FAQs, links to active user forums and scores of sample drawings.

But enough. At this point, you're asking yourself, "How do I choose a program? How do I pick one over the others?"

Sorting through the Options

The program best suited to you depends on how up-to-date your computer is, how determined you are to master CAD and, finally, what sort of drawings you want to create.

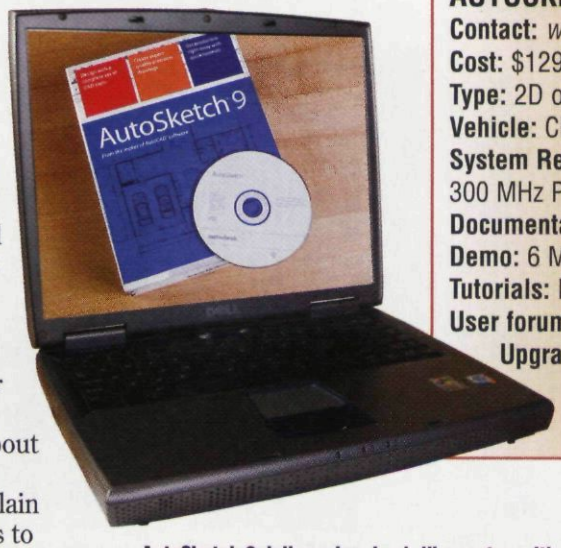
Most CAD programs run on Windows-based personal computers. (A few will run on Macs; see *"CAD for Macs,"* page 84). The newer your computer is, the more CAD programs you have to choose among, and the more efficiently the one you select will run. CAD is geometry, and the computations required as you build and modify your drawings are endless. The faster your computer's processor, the better. For 3D modeling to run smoothly, you should have a 1 or 2 GHz Pentium 4 processor and 512 MB or more of RAM, along with a powerful graphics card and high-

resolution (and expansive) monitor.

If you have a five-year-old computer and upgrading is not an option, focus on the simpler 2D programs.

The more capabilities a program has, the harder it will be to master. All the highfaluting tech talk — about "polar angle tracking" and "Boolean tools" — is just plain noise to me. What I want is to draw is a series of lines to compose a bookcase or a table. With that in mind, here are CAD functions I consider basic:

- Drawing lines of specific length and orientation.
- Connecting one line to another, with a good degree of precision.
- Controlling the alignment of lines — horizontal, vertical and specified angles.



AutoSketch 9 delivers in a book-like carton with lots of descriptive text and images. Inside the box is a single CD-ROM disk with the program and a printed "Getting Started" manual.

- Altering lines by erasing, trimming or extending them.
- Drawing shapes like boxes, circles and ellipses.
- Moving, rotating and copying lines, shapes and the objects they form.
- Extracting dimensions of lines and shapes as well as distances between points.
- Stretching, compressing or rescaling lines, shapes and objects.
- Saving drawings or selected parts of drawings.
- Printing out drawings or selected parts of drawings to fit the sheet, to a specified scale or in actual size.

Tool Review continues on page 88 ...

AUTOSKETCH 9
Contact: *www.autodesk.com*
Cost: $129
Type: 2D only
Vehicle: CD-ROM
System Requirments: Windows XP
300 MHz Pentium III or better
Documentation: 124-page printed manual
Demo: 6 MB download, 45-day time limit
Tutorials: Drawing exercises in manual
User forum: *//discussion.autodesk.com/index.jspa*
Upgrades: No (AutoCad is a different program)

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www.titebond.com
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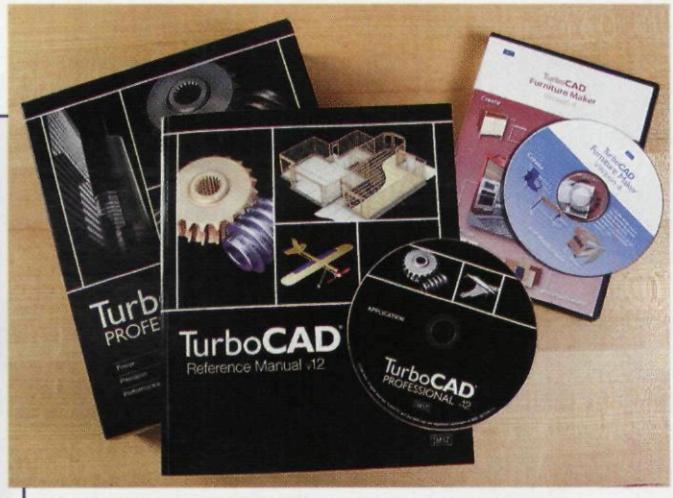
TURBOCAD DELUXE VERSION 12

Contact: *www.imsisoft.com*
Cost: $149.95
Type: 2D/3D
Vehicle: CD-ROM
Sys. req.: Windows 2000/XP Pentium III or better, 128+ MB RAM
Documentation: 519-page printed manual
Demo: Download; 15-day time limit
Tutorials: Books and CDs available for purchase
User forum: *//forums.imsisoft.com/forums/index*
Upgrades: TurboCAD Professional v. 12: $899.95

For more info on the web: use our QUIK-LINK



TurboCAD, a powerful 2D/3D program, is marketed in an economical Deluxe version and a full-featured (and much higher priced) Professional version. The blue-and-white CD-ROM is TurboCAD Furnituremaker, an add-on.

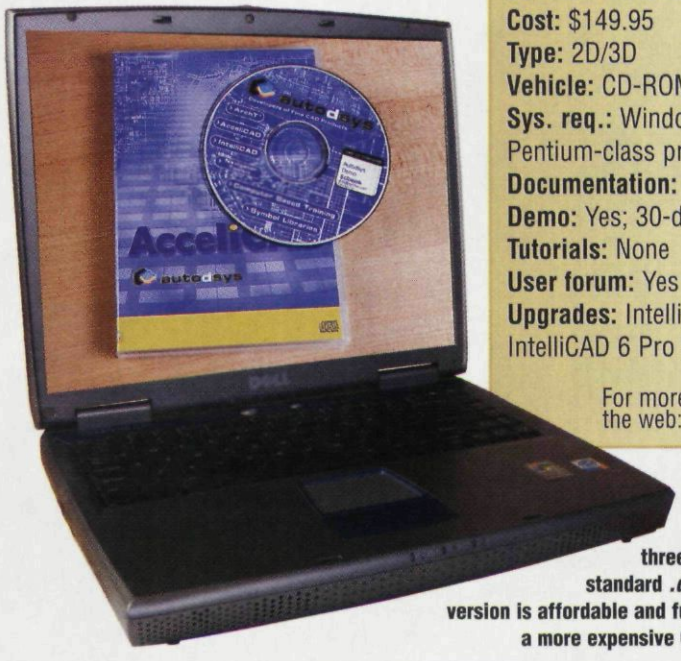
When I open a CAD program for the first time, I immediately try to draw a horizontal line of some specific length. I look first for an icon that says (symbollically), "Click me to draw a line." I click it. I move the cursor to the drawing window and click the left mouse button. I move the cursor. Does a line stretch from the start point? I let go of the mouse, type in a line length, and hit "enter." Does that result in making a line?

If I do have a line, I'm encouraged. If I don't, I'm sour. Diving into the manual or punching up "Help" may turn up an explanation of how to do it. But not always! In a few cases, I can only conclude it can't be done.

INTELLICAD 6

Contact: *www.autodsys.com*
Cost: $149.95
Type: 2D/3D
Vehicle: CD-ROM
Sys. req.: Windows 98/2000/XP Pentium-class processor, 128 MB RAM
Documentation: 587-page PDF
Demo: Yes; 30-day time limit
Tutorials: None
User forum: Yes
Upgrades: IntelliCAD 6 Pro ($249) IntelliCAD 6 Pro Plus ($349)

For more info on the web: use our QUIK-LINK



You can't tell a CAD program by the package label! Intellicad 6, sold in three versions, uses the industry-standard *.dwg file* format. The standard version is affordable and fully functional. (AcceliCAD is a more expensive CAD program from Autodsys.)

Shopping Suggestions

You have a lot of decisions to make. Here are some tips that I hope will help. First, I've put a "Best Bet" symbol on several programs that are on the short list of candidates to replace my AutoCAD LT98 (or at least to supplement it).

Second, visit the program web sites. Many allow you to download a PDF of the user manual. Do that, open it in Acrobat Reader and judge for yourself the features and how well they are explained.

You likely will find a link to a user's forum (I've provided web addresses to them as well). Visit them, even if you've got to register with the company to gain access. The questions asked and the responses given tell you a lot. A lack of activity says something, too, as does the lack of a forum.

A trial version of the program is likely to be available for download. I can't recommend downloading every available trial program; you'll be overwhelmed. But, do try before you buy.

CAD software should improve your drawing process, not create a nightmare. A good program can make designing a project as much fun (almost) as building it.

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